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of

WADE W. HENRIKSEN

and

CRAIG A. NIELSEN

for

APPARATUS AND METHODS FOR MAKING FROZEN FOOD PRODUCTS

KIRTON & MCCONKIE
A PROFSSEIONAL CORPORATION
ATTORNEYS AT LAW
1800 EAGLE GATE TOWER
60 EAST SOUTH TEMPLE
SALT LAKE CITY, UT 84111
TELEPHONE: (801) 328-3600
FACSIMILE: (801) 321-4893

BACKGROUND

1. Field of the Invention

The present invention relates generally to methods and apparatus for making frozen desserts and similarly frozen food products. More particularly, the present invention relates to an apparatus and method that can be used to make and dispense both ice cream and iced slush drinks.

2. Background

Several types of ice cream making devices are known in the art. It has long been known that, in order to prevent the formation of large ice crystals, it is necessary to stir the ice cream mix while freezing it. In the earliest forms of domestic ice cream makers, an outer container had within it a rotatable inner container. The space between the two containers was filled with a mixture of ice and salt, and ice cream mix was placed in the inner container. The inner container was then rotated, the ice cream mix being stirred by means of a fixed mixing blade. Alternatively, the mixing blade was instead rotated.

In many modern ice cream making devices, the rotation causing the mixing motion is carried out by means of an electric motor. After the electric motor is switched on, the mixing blade begins to turn, thereby mixing the ice cream mixture. Any ice cream forming on the cold container is scraped off and mixed back into the ice cream mixture. This mixing continues until ice cream of the desired temperature and consistency remains.

Some ice cream making devices, instead of using a mixture of ice and salt to keep the ice cream container cold and thereby freeze the ice cream mix, use an electric refrigerating

apparatus. Some devices are designed to include their own portable refrigerating apparatus attached to the ice cream containers; other devices are designed to simply be placed inside the freezer compartment of a typical domestic refrigerator.

SUMMARY AND OBJECTS OF THE INVENTION

The present invention can generally be characterized as an efficient machine with a substantially horizontal, elongate spindle and a paddle wheel that travels along the length of the spindle. A canister encloses the spindle, and the spindle is coupled to a driving device that spins the spindle around its lengthwise axis.

In the preferred embodiments, the canister has a cylindrical, substantially horizontal configuration. Also, a refrigeration unit, coupled to the canister, maintains the canister at a temperature cold enough to cause a frozen food mixture within it to freeze. Some embodiments of the present invention include a removable dispensing block that dispenses the ice cream or other frozen food inside the canister with a handled shaft that is pulled upward and then pushed downward.

Accordingly, it is an object of some embodiments of the present invention to provide a horizontal frozen food mixing and dispensing machine having a spindle encircled by a paddle wheel that travels along the length of the spindle through a recessed, crisscrossed track.

It is another object of some embodiments of the present invention to provide a unique method of making ice cream, slushes and other frozen food products in which the ingredients are simultaneously mixed, stirred, and pushed via a horizontal mixing spindle and a paddle wheel that travels back and forth along a crisscrossed track on the mixing spindle.

It is yet another object of some embodiments of the present invention to provide an efficient frozen food making and dispensing machine suitable for domestic-use that has a horizontal mixing spindle which is enclosed by a horizontal cooling canister.

Another object of some embodiments of the present invention is to provide a frozen food making and dispensing machine with a horizontal spindle that can make traditional ice cream as well as slushes, granita, and other types of frozen food products.

Yet another object of some embodiments of the present invention is to provide a frozen food making method that simultaneously mixes, scrapes, and pushes the food product within a horizontal cooling cylinder containing a spindle with a recessed, crisscrossed track.

These and other objects and features of the present invention will become more fully apparent from the following description, drawings, and the appended claims. Other objects will likewise become apparent from the practice of the invention as set forth hereafter.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing and other objects and features of the present invention will become more fully apparent from the following description and appended claims, taken in conjunction with the accompanying drawings. Understanding that these drawings depict only typical embodiments of the invention and are, therefore, not to be considered limiting of its scope, the invention will be described and explained with additional specificity and detail through the use of the accompanying drawings in which:

Figure 1 is a front perspective view of one embodiment of the present invention.

Figure 2 is a front elevational view of the embodiment of the present invention shown in Figure 1 wherein the paddle wheel can be seen through the transparent dispensing block.

Figure 3 is a front plan view showing one embodiment of the present invention in which both the mixing spindle and the dispensing block have been removed from the cooling canister.

Figure 4 is a back elevational view of the embodiment of the present invention shown in Figure 1.

Figure 5 is a side view of the mixing spindle and paddle wheel of one embodiment of the present invention.

Figure 6 is a sectional view of the mixing spindle and paddle wheel as taken along lines 6-6 in Figure 5.

Figure 7 is a perspective view of the paddle wheel of Figure 5.

Figure 8 is a side sectional view of the present invention showing the mixing spindle and paddle wheel inside the cooling canister.

Figure 9 is an exploded perspective view of a flux capacitor in accordance with one embodiment of the present invention.

Figure 10 is a back perspective view of the dispensing block of one embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The following detailed description, in conjunction with the accompanying drawings (hereby expressly incorporated as part of this detailed description), sets forth specific numbers, materials, and configurations in order to provide a thorough understanding of the present invention. The following detailed description, in conjunction with the drawings, will enable one skilled in the relevant art to make and use the present invention.

The purpose of this detailed description being to describe the invention so as to enable one skilled in the art to make and use the present invention, the following description sets forth various specific examples, also referred to as "embodiments," of the present invention. While the invention is described in conjunction with specific embodiments, it will be understood, because the embodiments are set forth for explanatory purposes only, that this description is not intended to limit the invention to these particular embodiments. Indeed, it is emphasized that the present invention can be embodied or performed in a variety of ways. The drawings and detailed description are merely representative of particular embodiments of the present invention.

Reference will now be made in detail to several embodiments of the invention. The various embodiments will be described in conjunction with the accompanying drawings wherein like elements are designated by like alphanumeric characters throughout.

With reference now to the accompanying drawings, Figure 1 presents a front perspective view of one embodiment of the frozen food product making device 10 of the present invention. The device 10 has a cooling canister 22 for holding ice cream or other frozen food products. For the sake of simplicity, the term "ice cream," for purposes of this detailed description, as well

as for purposes of the appended claims is being used as a shorthand description and designation for any frozen food product, including ice cream, ice milk, slush, granita, frozen yogurt, milk shakes, frozen custard, sherbet, sorbet, or other similar frozen food products.

Cooling canister 22 rests in a substantially horizontal position and is made of material suitable for freezing ice cream ingredients that are in direct contact with the inside walls of canister 22. In the preferred embodiments, the cooling canister 22 is made of metal. Also, as described further below, the interior shape of the cooling canister 22 is preferably substantially cylindrical. Here, the cooling canister 22 is shown as having a housing with a rounded top portion 19, making the canister's exterior shape substantially cylindrical.

Cooling canister 22 has a dispensing block 16 removably coupled, via retaining knobs 14, to the front of the ice cream maker 10. Dispensing block 16, here shown as made of a transparent plastic material, has a handle 12 by which a person can dispense the ice cream or other food product when the user pulls up and then pushes down on the handle 12.

Housing 24 houses suitable conventional refrigeration devices 72 (such as, for example, a compressor, condenser, and/or condenser fan motor), as shown generally in phantom lines in Figure 8, which maintain the cooling canister 22 at a temperature cold enough to cause a frozen food product mixture to freeze to an appropriate degree. Refrigeration devices 72 may be coupled to the frozen food making device 10 in any suitable manner, such as by means of refrigeration coils as illustrated in Figure 8, as will be readily understood by those skilled in the art. A front vent 18 in housing 24 provides a vent for the refrigeration devices 72. The front vent 18 can be of any suitable shape and can be located at any suitable place on the housing 24.

Importantly, canister 22 is provided with a flux capacitor valve 20. Flux capacitor 20 is a one-way valve and is positioned on top of canister 22 so as to communicate with the interior of canister 22 at a location farthest away from dispensing block 16 (see Figure 8). Flux capacitor allows air into canister 22 in order to permit the food product to be dispensed through dispensing block 16, as will be described in further detail below. In addition, flux capacitor 20 provides an opening to canister 22 through which a frozen food product mixture may be poured into cannister 22.

On/off switch 28 turns on a driving device 38 (shown in Figure 4) as well as the refrigeration devices 72. Indicator light 26 indicates when the switch 28 is in the "on" position. Alternatively, light 26 may be used to indicate that the contents of canister 22 are at a desired temperature and that the frozen food product is thus "done." In some embodiments, knob 30 is a temperature control that controls the operation of refrigeration devices 72 and provides for variation in the temperature of the cooling canister 22. Alternatively, knob 30 may be attached to a timer to automatically turn off device 10 after a predetermined period of time. In describing switch 28, light 26, and knob 30, it will be readily understood that device 10 may have any of a wide variety of desired user controls. For example, device 10 may be equipped with a push button start switch instead of toggle switch 28.

Figure 2 shows a front elevational view of the embodiment of the present invention shown in Figure 1 wherein a paddle wheel 32 can be seen through the transparent dispensing block 16. A mixing spindle 33 can also be seen through the transparent dispensing block 16. Both the paddle wheel 32 and the mixing spindle 33 are described further in conjunction with the discussion accompanying Figures 5 through 8.

Figure 3 illustrates a front plan view showing one embodiment of the present invention in which both the mixing spindle 33 and the dispensing block 16 have been removed from the cooling canister 22. Here, it can be seen that the cooling canister 22 has a substantially circular mouth or front opening 37 to a substantially cylindrical inner food container 67 (shown in Figure 8) that preferably has a smooth surface. The back of the container 67 has a recess 34 (again referring to Figure 3) for receiving a spindle extension 46 (see Figure 5). Recess 34 also contains a drive shaft 36 (seen best in Figure 8) which fits into a hole in the mixing spindle 33 so that when the drive shaft 36 is spun around its lengthwise horizontal axis, the mixing spindle 33 also spins around the same horizontal axis.

Figure 4 shows a back elevational view of the embodiment of the present invention shown in Figure 1. Driving device 38 is coupled to the cooling canister 22 for spinning the drive shaft 36 around the drive shaft's lengthwise horizontal axis. The driving device 38 is here shown as an electric motor. However, the driving device 38 can be any type of appropriate drive mechanism for spinning the drive shaft 36. Incidentally, a back vent 40 is shown on the back side of the housing 24. As was mentioned above in conjunction with the front vent 18, the back vent 40 is a vent for the refrigeration devices 72 and can be of any suitable shape as well as at any suitable location on the housing 24.

Figure 5 is a side view of the mixing spindle 33 and paddle wheel 32 in one embodiment of the present invention. The mixing spindle 33 is elongate, has a substantially horizontal, lengthwise axis, and is rotatable about its lengthwise axis. In the preferred embodiments, mixing spindle 33 is made of a solid plastic material. Nevertheless, mixing spindle may also be made of metal or any other suitable material. Mixing spindle 33 has a continuous,

crisscrossing, recessed track 44 all around its lengthwise outer surface 45. The crisscrossing track 44 is a closed-loop track and has front-end obtuse angles 50 and back-end obtuse angles 54 for changing the direction of the paddle wheel 32 (the details of the manner in which the direction is changed will be further discussed below). O-rings 48 on extension 46 help create a snug fit when mixing spindle 33 is coupled to drive shaft 36 within recess 34 (the latter two elements being shown in Figure 3) of the canister 22.

Paddle wheel 32 encircles the mixing spindle 33. Paddle wheel 32 preferably has a rounded circumference that fits snugly against the inner food container 67 of the canister 22 (see Figure 8) and yet can nevertheless slide along the container 67 of the canister 22. Paddle wheel 32 includes a block 43 and a plug hole 42 within the block 43, both of which can be seen in Figure 6 (which shows a sectional view of the mixing spindle 33 and paddle wheel 32 as taken along lines 6-6 in Figure 5) and in Figure 7 (which shows a perspective view of the paddle wheel 32). Paddle wheel 32 also includes staggered paddles 62 and a series of holes 64. The holes 64 allow ice cream or other frozen food product ingredients to flow through the paddle wheel 32 when it moves along the length of the mixing spindle 33.

In one embodiment, paddle wheel 32 is made of a plastic material. Alternatively, paddle wheel 32 may be made of metal or any other suitable material.

As shown in Figure 6, a free-floating, rotatable plug or guide skate 60 sits within the plug hole 42. Guide skate 60 is a smooth cylindrical piece with a shelf-like protrusion which extends into the crisscrossing recessed track 44. Alternatively, guide skate 60 may be provided with guide pins or other suitable guiding structures. Guide skate 60 is freely rotatable within the plug hole 42 around its lengthwise axis. In other words, guide skate may freely rotate a full

360 degrees about such axis. In addition, in some embodiments, guide skate 60 is free-floating in that it is not fixed to anything within the plug hole 42. For example, as shown in Figure 6, guide skate 60 may be held inside the plug hole 42 by an inner threaded cap 58 and an outer threaded cap 56. The caps 58 and 56 each have a recessed portion on their outer surfaces for receiving, for example, a flathead screwdriver. This allows the caps to be easy unscrewed and removed so that the guide skate 60 can be removed or replaced. It should be emphasized that the caps 58 and 56 can be one piece and need not be threaded. Caps 58 and 56 may be replaced by any sort of cap suitable for preventing the guide skate 60 from falling out of the block 43.

Referring now to Figure 8, shown is an embodiment of the frozen food product maker 10 as it is fully assembled. Here, the paddle wheel 32 hugs the mixing spindle 33 so that the plug or guide skate 60 extends into the recessed track 44 on the spindle 33. When the driving device or motor 38 is turned on, the motor spins its drive shaft 36, which, in turn, spins the mixing spindle 33 that is coupled to the drive shaft 36. As the spindle 33 spins around its lengthwise horizontal axis, the moving slant of the now-rotating recessed track 44 urges the guide skate 60 along the track 44, thereby pulling the paddle wheel 32 across the lengthwise outer surface 45 of the spindle 33. The guide skate 60 is shaped so that its lengthwise extension or other guide structure is parallel to the direction of its travel within the track 44. Thus, at crisscrossed junctions 52 (see Figure 5), the guide skate 60 does not cross over into the portion of the track 44 that crisscrosses with the portion of the track 44 that the guide skate 60 is currently traveling within.

However, when the guide skate 60 comes to obtuse angle 50 at one end of the spindle 33, the guide skate 60 changes direction and causes the paddle wheel 32 to reverse and

move towards the opposite end of the spindle 33. The guide skate 60 then moves along the portion of the track 44 that crisscrossed with the portion of the track 44 that it had just traveled along. When the guide skate 60 comes to the obtuse angle 54 at the other end of the spindle 33, the guide skate 60 causes the paddle wheel 32 to again reverse its direction of travel along the spindle 33. This back-and-forth movement of the paddle wheel 32 pushes the ice cream or other frozen food product back and forth inside the cooling canister 22 and continues as long as needed.

As the paddle wheel 32 moves back and forth along the length of the spindle 33, it should be noted that the guide skate 60, and, accordingly, the paddle wheel 32, additionally rotate around the circumference of the spindle 33 as the guide skate 60 is guided along the track 44. Advantageously, this combination of rotation and back-and-forth movement (which, in other words, could be described as a back-and-forth helical movement) of the paddle wheel 32 causes the paddle to simultaneously mix, whip, and scrape the frozen food product, and then, when desired, to push the food product the dispensing block 16 for dispensing. Also, it will be noted that even though the paddle wheel 32 reverses its direction of travel along the length of the spindle 33, the drive shaft 36 and spindle 33 do not change their direction of rotation.

In the preferred embodiments, flux capacitor 20 can be forced open (as shown in Figure 9), or alternatively, flux capacitor 20 may be removed, so that ingredients can be poured into canister hole 21. During mixing, flux capacitor 20 prevents air or food product from escaping from canister 22 through the hole 21.

After the ice cream or other frozen food product is mixed, a person may pull up on the dispensing handle 12 to allow frozen food in the cooling canister 22 to exit through the front

opening 37, into a hole 68 in the dispensing block 16, and out of bottom hole 70. During dispensing, air enters to canister 22 through flux capacitor 20. The person may then push down on the handle 12 (to the position shown in phantom lines), thereby pushing the product that is in the dispensing block 16 through the bottom hole 70 for final dispensing.

Figure 9 shows an exploded perspective view of one embodiment of the flux capacitor or valve 20. Flux capacitor 20 may be any type of appropriate valve that serves to accommodate the flow of air as described above. However, this particular embodiment includes a substantially cylindrical body 75 defining an open passageway 77. A flat disc portion 79 is attached to one edge of the bottom end of flux capacitor 20, as shown. Disc 79 may be pushed away from the bottom end to allow food product to be poured through passageway 77. As will be appreciated, disc 79 also serves to seal passageway 77 to prevent air or the food product from escaping from canister 22 during mixing. Flux capacitor may be made of any suitable material. In some embodiments, for example, flux capacitor if formed of a resilient plastic or rubber material.

The position of flux capacitor 20 on canister 22 is also important. As mentioned previously, flux capacitor communicates with the interior housing 67 of canister 22 at a location that is opposite the open mouth 37 though which food product is dispensed. During dispensing, therefore, air enters canister 22 behind the food product and cooperates with the back and forth motion of the paddle wheel 32 to force the food product toward the mouth 37 of canister 22. This ensures that all of the food product within canister 22 can be dispensed through mouth 37 and the associated dispensing block 16.

Figure 10 shows a back perspective view of one embodiment of the dispensing block 16 when detached from the cooling canister 22. The function of the dispensing block 16 is to dispense the ice cream or other food product contained within the cooling canister 22. Any sort of appropriate dispensing block 16 may be used. However, in this particular embodiment, the dispensing block 16 is made of a transparent block of plastic that is removably attached to the cooling canister 22 to facilitate reaching inside of the canister 22 for repairs or for cleaning. Retaining knobs 14 (shown in Figure 1) have threaded rods (not shown) that extend through retaining holes 82 and screw into threaded holes (not shown) on the front face of the canister 22. A large o-ring 86 seals the open mouth or front opening 37 (shown in Figure 3) of the canister 22. A cylindrical hole 88 in the dispensing block 16 receives a dispensing shaft 66. Small o-rings 90 on the dispensing shaft 66 create a seal between the dispensing shaft 66 and the cylindrical hole 88. However, the seal is not so tight that the dispensing shaft 66 cannot slide within cylindrical hole 88. As was mentioned above in conjunction with the discussion of Figure 8, the food product enters the dispensing block 16 through hole 68 and exits the block through hole 70.

Unlike other devices existing in the art, the present invention can mix either standard ice cream or slushes and other similar frozen foodstuffs. Hence, the present invention provides an extremely efficient frozen food making device which uses a unique mixing spindle and paddle combination that simultaneously mixes, scrapes, and pushes the frozen food product. The device can be readily configured as a counter-top unit for convenient domestic use. Of course, the device can also be made of a size and configuration suitable to commercial use.

It is underscored that the present invention may be embodied in other specific forms without departing from its spirit or essential characteristics. The described embodiments herein should be deemed only as illustrative. Indeed, the appended claims indicate the scope of the invention; the description, being used for illustrative purposes, does not limit the scope of the invention. All variations that come within the meaning and range of equivalency of the claims are to be embraced within their scope.

What is claimed is:

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